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(54) Method and apparatus for remote supervision of goods

This invention relates to a method and apparatus for remote supervision of goods.

Several protection systems have been developed to prevent or hinder violation of public or private property. These systems utilize state of the art technology to fight the newest and most cunning illegal actions.

Several precautions may be taken to prevent various kinds of property violation. In common, we refer to these as methods of theft prevention. Among said methods, the importance of methods for supervision of goods is continuously growing at the time; this is also true for methods providing efficient means to intervene when the property is

violated. These methods are usually implemented in the form of an upgrade to existing security systems.

The patent US 5,225,713 describes a security system for motorized vehicles. When an unauthorized attempt is made to start the vehicle, the security system blocks the ignition circuit and starts a timer, during which the system may be deactivated. If the timer expires, local acoustic and visual alarm signals are set off. The cellular phone located in the car may be used to deactivate the security system, where a pre-determined code must be typed in using the keypad of the cellular phone. However, said system provides means for local alarm and vehicle blocking with local disengagement only. Even though local alarm draws attention to the vehicle, people tend not to show response anymore. The perpetrator can deactivate the alarm or try to tow the vehicle away.

Hungarian patent P9303661 (filing No. T/69211) describes a system for detecting and preventing the use of stolen or illegally operated motorized vehicles. This system is based on the existing cellular phone network utilizing the communication means and channels thereof. In case of a theft, the stolen car may be called on its built-in cellular phone, through which a sending unit sends a coded signal to a receiving unit. The receiving unit decodes the signal and commands the effector unit to execute the following steps according to a desired order and timing:

- Turn on all light signals of the vehicle;
- Blow the horn of the vehicle;
- Disable the ignition of the vehicle;
- Engage the central lock of the vehicle;
- Call a pre-programmed number and send a signal.

Although said system features a combination of acoustic signals, visual signals, vehicle disabling and remote detection, it does not have means to keep the owner posted on the status of his vehicle; neither does it provide means for the owner to decide what kind of action should be taken. The same action takes place every single time a remote intervention is initiated, giving satisfactory results but in a few cases.

The patent WO 94/13515 describes a radio alarm system for mobile objects. In case of an alarm, said alarm system transmits vehicle specific data from the vehicle to a cellular exchange using a built-in radio transceiver. The data received by the cellular

exchange is complemented by the position data of the vehicle. Said data is forwarded to a next exchange, from which it may be transmitted to one or more predefined telephone numbers (e.g. that of the police department, insurance firm, or the owner). It is also possible to remotely control the alarm system of the mobile property via coded signal transmission, wherein said coded signal may be used to engage/disengage local acoustic and visual alarm means, ignition, fuel shut-off and steering. Said functions are implemented using a control unit, a data storage unit, a transceiver, a code storage unit; an evaluation unit, a detecting unit, an alarm warning unit and a breaking unit installed in the mobile object or vehicle. Undue complexity is a major drawback of the system described above. Yet another disadvantage of the system is that messages are coded in both directions; therefore, they can not be interpreted without adequate means. If said means are not present, the notified person is unable to take any kind of action, thus the remote alarm falls short of having any effect at all.

The patent US 5,515,043 describes a cellular/GPS system for vehicle tracking. According to said system, the vehicle comprises a cellular phone, a GPS receiver and a voice synthesizer. The cellular phone of the vehicle may be called from a remote telephone apparatus, through which the vehicle's position and speed may be retrieved. Retrieved data is converted to voice synthesized signal in any language. The system also automatically calls one or more pre-programmed telephone numbers, gives alarm warnings and demobilizes the vehicle upon the occurrence of certain events, such as the alarm being set off, collision, or the pressing of a panic button. Said system allows for transmission of GPS data and speed data in voice synthesized signal only, and it also requires a voice synthesizer. The horn of the vehicle may be sounded, its light signals may be turned on, a built-in speaker may be sounded, the vehicle may be demobilized, or other action may be taken by making an external call and typing in a correct PIN (personal identification number) code.

It is therefore an object of the present invention to provide method and apparatus capable of voice communication and remote supervision, allowing the notified person to take diverse actions without having to type a code, or after the grant of a personal identification code if the person is authorized for inquiry and intervention.

Yet another object of the present invention is to provide method and apparatus for remote supervision allowing continuous or cyclic monitoring of detectors located anywhere within the object. The present invention does not trigger the local alarm automatically, so it can operate undetected; furthermore, the present invention implements all means of intervention via remote-control.

The present invention is based on a method in which goods are monitored continuously or periodically at designated locations without human supervision, wherein remote alarm is triggered via telecommunication means (preferably via telephone, rather preferably via cellular phone) upon a predefined change of the monitored locations' parameters, wherein the cause of the alarm is preferably transmitted in the form of spoken speech, further the local alarm means and partial/overall functionality of the monitored object is controlled from the remote telephone apparatus using DTMF (dual tone multi frequency) coded voice signals within the same calling session. In case of an incoming call, controlling actions may be performed following identity verification. According to the present invention, a list of preferable actions in respect to the given situation is transmitted along with the cause of the alarm in the form of spoken speech. This feature facilitates the notification of technically less inclined clients. With the above enhancement, all information required for remote intervention is available in spoken speech.

In a preferred embodiment of the method according to the present invention, priorities are assigned to each of the monitored locations within the object. In case of an alarm, the sequence in which voice messages are forwarded corresponds to said priorities. This prevents less important messages getting in the way of more important ones. In a system according to the above embodiment, the notified person can make a decision based upon one single highest priority information, significantly reducing the delay of effective intervention.

According to another preferred embodiment of the present invention, an observed location of the protected object may be remotely selected. The notified person is posted continuously or periodically on the status of the selected location in spoken speech. This enhancement allows us to continuously monitor the status of a selected detector, and to

discern changes immediately. Thus, the notified person gets far more accurate information about the momentary status of the object.

The method according to the present invention includes means for changing the PIN code of the person authorized for inquiry and intervention via a remote procedure.

The method according to the present invention also includes means for changing the notification data (i.e. telephone number) of the notified person(s) via a remote procedure.

The present invention also provides an apparatus for the implementation of said method for remote supervision of goods, comprising:

- an alarm unit having at least one detector for monitoring a selected location of the object;
- a control unit, the input of said control unit being connected to said alarm unit, and the output of said control unit being connected to at least one effector unit capable of setting off a local alarm (e.g. acoustic or visual signals) or inducing partial/full malfunction;
- a radio transceiver connected to said control unit, preferably a local cellular phone;
- a DTMF decoding device capable of decoding control signals connected between said control unit and said telephone;
- a voice storage device for storing outgoing messages;
- a local power supply;
- and a remote-control unit capable of radio communication incorporating a DTMF encoding device. The control unit of the apparatus according to the present invention further comprises an exchange unit. Said exchange unit analyzes and evaluates incoming signals, and it also selects and transmits voice messages stored in the voice storage device corresponding to preferable actions in respect to the given situation.

In a preferred embodiment of the apparatus according to the present invention, said control unit comprises a priority encoder for the detectors at the monitored locations of the object.

According to the present invention, said remote-control unit incorporating said DTMF encoding device, used for communication with the local cellular phone also comprises a speaker, a microphone, a keypad and an optional display.

In another preferred embodiment of the apparatus according to the present invention, said remote-control unit is preferably either a land-line based telephone apparatus incorporating a keypad, or a cellular network based mobile telephone apparatus.

The features and advantages of the present invention will be more clearly appreciated from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a block diagram of an apparatus according to the present invention;

FIG. 2 is a block diagram of an apparatus according to the present invention applied for the protection of immovable goods;

FIG. 3 is a block diagram of an apparatus according to the present invention applied for the protection of mobile goods.

As seen on FIG. 1, the apparatus according to the present invention comprises a local cellular phone 8 communicating with a distant remote-control unit 10. Preferably, said distant remote-control unit 10 is also a cellular phone. Said local cellular phone 8 is connected to a control unit. Said control unit comprises:

- a microprocessor 1 such as the Z80 microprocessor;
- a read-only EEPROM (electronically erasable and programmable read-only) memory device 2 such as the 27C512 type EEPROM, connected to said microprocessor 1;
- a port controller circuit and read-write storage device 3 such as the 8255 type port controller circuit and read-write storage device;
- a DTMF decoding device 4 such as the MT8870 type DTMF decoding device;
- a voice storage device 5 such as the ISD1416 type voice storage device.

The local cellular phone 8 is communicating with the control unit via said port controller circuit and read-write storage device 3, said DTMF decoding device 4 and voice storage device 5. According to the present invention, the outputs 6.1, ..., 6.8 of detectors and the command inputs 7.1, ..., 7.8 of effectors located on the monitored object are connected to the corresponding inputs and outputs of said port controller circuit and read-write storage device 3, preferably a RAM (random access memory). The control unit is powered by a local power supply 9. Said local power supply 9 is preferably a rechargeable accumulator providing continuous power supply.

By default, the control unit is in standby mode. Signals emitted by said outputs 6.1, ..., 6.8 of detectors are transmitted to said microprocessor 1 via controller circuit and read-write storage device 3. Said microprocessor 1 analyzes and evaluates the status of said detectors based on the program stored in memory device 2. Said microprocessor 1 follows a processing priority order established by the program, thus implementing priority coding. In case of a change exceeding a predefined limit, the control unit goes into alarm mode. When this happens, the control unit dials at least one pre-programmed phone number via local cellular phone 8. Calls are repeated for each number until the called person picks up. When a calling session has been established, the control unit sends voice information about the event causing the alarm, as well as a list of preferable actions in respect to the given situation. When an authorized person makes an incoming call (an inquiry), the requesting of a PIN code is also done in spoken form. Said microprocessor 1 retrieves the appropriate messages from said memory device 2 based on the program stored in said voice storage device 5, and then it forwards said messages to the audio input of said local cellular phone 8. The notified person replies by typing his PIN number (preferably a number having several digits) followed by the preferably single digit code of the selected action, using the keypad of said remote-control unit 10. Said PIN code is transmitted via DTMF coding. In the preferred embodiment, DTMF code signals are generated by a land-line based telephone apparatus incorporating a keypad, or a cellular network based mobile telephone apparatus. The processor 1 verifies the PIN number based on the program stored in the memory device 2. If the verification fails, the calling session is terminated and a new number is dialed. Yet if the verification returns a success, the calling session does not terminate, and the control unit is ready to receive further action codes in the form of DTMF signal codes. Incoming DTMF code signals are transmitted from the audio output of the local cellular phone 8 to the DTMF decoding device 4 of the control unit, from where they can be retrieved and processed in digital form. The possible actions of intervention comprise the turning on/off the local alarm; furthermore, the vehicle can be partially or fully demobilized, and the selected detectors can be monitored continuously or periodically. Depending on said program, the notification data (i.e. telephone number) of the notified persons can be changed via a

remote procedure. The local power supply 9 is also monitored. Remote alarm procedure is initiated if the voltage level decreases or disappears.

FIG. 2 shows a specific application of the invention, wherein the apparatus 11 according to the present invention is installed a real property 17. If apartments, offices, warehouses and other buildings must be supervised, it is preferable to utilize microphones and cameras 14, as well as other devices including detectors monitoring for smoke, motion, breaking of windows, opening of doors and windows, etc. Effector units, such as a sound unit 16, a light unit 18, a safety relay, a remote-controllable fire extinguisher or a smoke/gas diffuser 15 may be implemented. In case of an alarm, the local cellular phone calls the notified person 12. After granting the PIN code on the cellular phone 13, said person 12 may operate any of the effectors, call the police, call the neighbors, or hurry to the venue.

FIG. 3 shows a specific application of the invention, wherein the apparatus according to the present invention is installed into a mobile object, such as a vehicle 21. Besides microphones and cameras, various detectors can be connected to the control unit to monitor any of the following: door/bonnet/boot ajar; broken window; vehicle motion; attempt to operate vehicle; engine noise; etc. Effector units, such as a sound unit 16, a light unit 18, a central lock operating unit, a motor disabling relay 20 inhibiting the operation of an engine control unit 19, a magnetic valve for fuel interruption, a radio transmitter sending position data, and other units. Upon unauthorized operation, break in or towing, the signal of the corresponding detector puts the control unit into alarm mode, and it dials at least one pre-programmed phone number via a local cellular phone. The notified person can intervene without terminating the calling session by choosing any of the possible actions offered, without being asked for a PIN code. Thus, said person may remotely select and operate any of the effectors. In case of an incoming call, intervention is preceded by PIN code verification. Intervention comprises actions such as the operation of a local alarm (sound/light); disabling engine operation; give an audible voice warning; etc. Of course, it is also possible to notify the police or a security firm, and to engage the radio transmitter for positioning. If the local alarm is not turned on, an unauthorized person will not be aware of the presence of said remote supervision and alarm apparatus; therefore, the unauthorized person will not make an attempt to disable it.

The remote supervision apparatus keeps the notified person continually posted on the status and position of the protected object (such as a vehicle), making it easy to find. Furthermore, the perpetrator can be easily surprised and apprehended.

It is an advantage of the method and apparatus according to the present invention that the alarm and standby modes are indistinguishable for an unauthorized person; thus, the system does not draw attention. At the same time, the notified person is informed immediately upon the occurrence of an alarm, enabling said person to initiate an action of his/her choice. Providing information in the form of voice messages makes the system easier to handle. Spoken information enables quick decision making for the technically less inclined. The continuous or periodical monitoring of a selected detector gives actual information on any changes regarding the object's status, and the method of intervention can be changed accordingly.

The supervision apparatus according to the present invention has been described in relation to alarm units; however, this does not imply a limitation of use. The supervision apparatus according to the present invention can be used for remote supervision of industrial processes, remote-control of heating systems in apartments and houses, remote-control of watering systems in gardens or lands, etc.

Claims:

1. Method for remote supervision of goods, in which goods are monitored continuously or periodically at designated locations without human supervision; remote alarm is triggered via telecommunication means (preferably via telephone, rather preferably via cellular phone) upon a predefined change of the monitored locations' parameters; the cause of the alarm is preferably transmitted in the form of spoken speech, further the local alarm means and partial/overall functionality of the monitored object is controlled from the remote telephone apparatus using DTMF coded voice signals within the same calling session or following identity verification in case of an incoming call,

wherein a list of preferable actions in respect to the given situation is transmitted to the notified person (12) along with the cause of the alarm in the form of spoken speech.

2. The method as set forth in claim 1, wherein priorities are assigned to each of the monitored locations within the object, and the sequence in which voice messages are forwarded in case of an alarm corresponds to said priorities.
3. The method as set forth in claim 1 or in claim 2, wherein an observed location of protected object may be remotely selected, and the notified person (12) is posted continuously or periodically on the status of the selected location via spoken speech.
4. The method as set forth in any of the claims 1- 3, wherein the PIN code of the person authorized for inquiry and intervention can be changed via a remote procedure.
5. The method as set forth in any of the claims 1- 4, wherein the notification data (i.e. telephone number) of the notified person(s) can be changed via a remote procedure.
6. Apparatus for remote supervision of goods, said apparatus comprising:
 - an alarm unit having at least one detector for monitoring a selected location of the object;

- a control unit, the input of said control unit being connected to said alarm unit, and the output of said control unit being connected to at least one effector unit capable of setting off a local alarm (e.g. acoustic or visual signals) or inducing partial/full malfunction;
- a radio transceiver connected to said control unit, preferably a local cellular phone;
- a DTMF decoding device capable of decoding control signals connected between said control unit and said telephone;
- a voice storage device for storing outgoing messages;
- a local power supply;
- and a remote-control unit capable of radio communication incorporating a DTMF encoding device,

wherein said control unit further comprises an exchange unit to analyze and evaluate incoming signals, said exchange unit further selecting and transmitting voice messages stored in the voice storage device (5) corresponding to preferable actions in respect to the given situation.

7. The apparatus as set forth in claim 6, wherein said control unit comprises a priority encoder for the detectors at the monitored locations of the object.
8. The apparatus as set forth in claim 6 or in claim 7, wherein said remote-control unit (10) incorporating said DTMF encoding device, used for communication with said local cellular phone (8) also comprises a speaker, a microphone, a keypad and an optional display.
9. The apparatus as set forth in claim 8, wherein said remote-control unit (10) is a land-line based telephone apparatus incorporating a keypad.
10. The apparatus as set forth in claim 8, wherein said remote-control unit (10) is a cellular network based mobile telephone apparatus.